

IN THE CLAIMS:

Please amend the claims as follows:

1. (Currently Amended) A robot simulation device, comprising of an input device, a display, a central computer, computing programs, an output device of teaching programs, and following means to simulate whether the robot can transfer an object in a working space where obstacles are located, without any interference in said working space:

(1) a two dimensional display having coordinate axes;

(2) a means to display said obstacles, said working space, a moving robot and said object transferred by said robot, on said display;

(3) a means to interpolate a path by designating path points of a central point of said moving object;

(4) a means to display a path wherein said object is moved in said working space; and

(5) a means to display an interference region of said path and said obstacles;

an environment defining ("ED") means for providing a virtual robot working environment in which a virtual robot works in a virtual working space where virtual obstacles are disposed, said virtual robot having a task of transferring a virtual object from a start point to a goal point, said ED means including a path determining means for determining a path of travel of said virtual object associated with said task of said virtual robot by designating via-points between said start point and said goal point; and

a task simulation executing and displaying ("TSED") means responsive to said ED means and said path determining means for executing simulation of said task of said virtual robot and displaying said executed simulation on a display; said TSED means including;

a robot activity region determining and displaying means for determining from said determined path of travel of said virtual object a robot activity region where a moveable portion of said virtual region moves to achieve said task and for displaying said robot activity region on said display; and

an interference region determining and displaying means responsive to said robot activity region for determining whether and where said task is interfered by said virtual obstacles thereby providing an interference region where said task is interfered by said virtual objects and for displaying said interference region on said display;

whereby a desired executed simulation is obtained, in which said virtual robot successfully transfers said virtual object from said start point to said goal point without being

interfered by said virtual obstacles.

2. (Currently Amended) A robot simulation device according to claim 1, further comprising:
a means of measuring and displaying traveling time of said object and said robot, and
a means of displaying a moving picture of said path of said ~~moving~~ object and said movable portion of said robot.

3. (Previously Presented) A robot simulation device according to claim 2, further comprising, a means of calculating traveling speed of said object and said movable portion of said robot.

4. (Currently Amended) A robot simulation device according to claim 1, wherein said display comprises a said two-dimensional display which displays a horizontal plane or a vertical plane of said working space.

5. (Previously Presented) A robot simulation device according to claim 1, wherein said obstacles and said working space are displayed by a polygonal form and / or a circular form.

6. (Currently Amended) A robot simulation device according to claims 1, wherein said path of said ~~moving~~ object is calculated by designating a departure point and a destination point of said robot on said display.

7. (Currently Amended) A robot simulation device according to claim 6, wherein ~~a~~ route and said path of said ~~moving~~ object is further calculated by designating a departure point and a plurality of destination points of said object on said display.

8. (Previously Presented) A robot simulation device according to claim 1, wherein a region where said robot is unable to transfer said object is calculated and displayed by designating a boundary of a movable region of said robot.

9. (Currently Amended) A robot simulation device according to claim 1, wherein ~~said~~ output device outputs ~~at least dimensions of said robot, said path of the moving robot, said~~

speed of the robot according to data which is achieved by a simulation, further comprising a teaching data producing ("TDP") means responsive to said TSED means for accepting said desired executed simulation in which said virtual robot successfully transfers said virtual object from said start point to said goal point without being interfered by said virtual obstacles and for producing teaching data based on said desired executed simulation in order that a real robot in the real world corresponding to said virtual robot uses said teaching data to perform a task corresponding to said task in an real working space corresponding to said virtual working space without being interfered by real obstacles corresponding to said virtual obstacles.

10. (Currently Amended) A robot simulation device according to claim 1, wherein the simulation device further teaches said teaching data is used to direct a motion of a movable part of the said real robot.

11. (Currently Amended) A robot simulation device according to claim 1, wherein said robot is a ~~scalar~~SCARA type robot and said object is a sheet like plate.

12. (Canceled)

13. (Currently Amended) A ~~method in connection with programming of a robot simulation device, which simulates whether a robot can transfer an object in a working space where obstacles are located, without any interference in said working space, comprising:~~

- ~~(1) displaying a two-dimensional display having coordinate axes,~~
- ~~(2) displaying said obstacles, said working space, a moving robot and said object transferred by said robot, on a display,~~
- ~~(3) interpolating a path by designating path points of a central point of said moving object,~~
- ~~(4) displaying a path wherein said object is moved in said working space,~~
- ~~(5) displaying an interference region of said path and said obstacles, and~~
- ~~(6) teaching a motion of movable part of the robot to the robot. of robot simulation comprising:~~

providing a virtual robot working environment in which a virtual robot works in a virtual working space where virtual obstacles are disposed, said virtual robot having a task of transferring a virtual object from a start point to a goal point, including determining a path of

travel of said virtual object associated with said task of said virtual robot by designating via-points between said start point and said goal point; and

executing simulation of said task of said virtual robot and displaying said executed simulation on a display, including:

determining from said determined path of travel of said virtual object a robot activity region where a moveable portion of said virtual robot moves to achieve said task, and displaying said robot activity region on said display; and

determining an interference region by determining whether and where said task is interfered by said virtual obstacles, and displaying said interference region on said display,

obtaining a desired executed simulation in which said virtual robot successfully transfers said virtual object from said start point to said goal point without being interfered by said virtual obstacles.

14. (Currently Amended) The method according to claim 13, further comprising:
measuring and displaying traveling time of said object and said robot, and
displaying a moving picture of said path of said moving object and said movable portion of said robot.

15. (Previously Presented) The method according to claim 14, further comprising:
calculating traveling speed of said object and said movable portion of said robot.

16. (Currently Amended) The method according to claim 13, further comprising:
displaying a horizontal plane or a vertical plane of said working space on said ~~two-dimensional~~ display.

17. (Previously Presented) The method according to claim 13, further comprising:
displaying said obstacles and said working space by a polygonal form and / or a circular form.

18. (Previously Presented) The method according to claim 13, further comprising:
calculating said path of said moving object by designating a departure point and a destination point of said robot on said display.

19. (Currently Amended) The method according to claim 18, further comprising:
calculating a route and said path of said moving object by designating a departure point and a plurality of destination points of said object on said display.

20. (Previously Presented) The method according to claim 13, further comprising:
calculating and displaying a region where said robot is unable to transfer said object by
designating a boundary of a movable region of said robot.

21. (Currently Amended) The method according to claim 13, further comprising:
outputting at least dimensions of said robot, said path of the moving robot, said speed of the robot according to data which is achieved by a simulation via said output device, accepting said desired executed simulation in which said virtual robot successfully transfers said virtual object from said start point to said goal point without being interfered by said virtual obstacles, and producing teaching data based on said desired executed simulation in order that a real robot in the real world corresponding to said virtual robot uses said teaching data to perform a task corresponding to said task in a real working space corresponding to said virtual working space without being interfered by real obstacles corresponding to said virtual obstacles.

22. (New) A robot simulation device, comprising:
a display device;
an input device structured to input information defining a virtual robot working environment in which a virtual robot works in a virtual working space where virtual obstacles are disposed, said virtual robot having a task of transferring a virtual object from a start point to a goal point;

a processor structured to:

determine a path of travel of said virtual object associated with said task
of said virtual robot by designating via-points between said start point and said
goal point;

execute simulation of said task of said virtual robot based on the
information defining a virtual robot working environment and the determined
path of travel, and display said executed simulation on the display device;

determine from said determined path of travel of said virtual object a

robot activity region where a moveable portion moves to achieve said task, and for displaying said robot activity region on said display device;

determine whether and where said task is interfered with by said virtual obstacles, thereby providing an interference region where said task is interfered with by said virtual obstacles and for displaying said interference region on said display device;

an output device structured to output said determined path of travel when it is confirmed that there is no interference in said simulation.